



Exploration of Human Systems Integration Issues in Next Generation Air Transportation System (NextGen)

Objective

The main goal of the project is to evaluate future air traffic management (ATM) systems and associated human-system interactions. One of the main challenges of examining future ATM systems is that future operations are generally underspecified in their descriptions of system functionality, procedures, performance measurements, and system status measurements (workload, amount of communication, and similar measurements). More traditional approaches to human factors that examine existing operations in well-defined systems are not best suited to analyze underspecified future ATM systems.



Approach

We evaluate ATM concepts by examining humans and technologies together as a single system. We accomplish this by exploring human-system interaction issues in a high-fidelity human-in-the-loop simulation environment designed to allow rapid prototyping of NextGen concepts. The simulation environment allows simulations of aircraft, ATM systems and communication infrastructure for both current day operations and a variety of future highly automated concepts. Controller workstations are realistic emulations of today's en route, TRACON and oceanic systems which extend carefully to include a full suite of advanced decision support tools such as conflict probes, trial planners, schedulers, speed advisories, merging and spacing advisories. Prior to running a human-in-the-loop simulation, information is gathered for the selected future concept. Since the details about the procedures, tools, human roles/responsibilities, and traffic situation are often underspecified in the concept descriptions, a considerable design effort is spent prior to the simulation to prototype them as needed. After the study, the data from the simulation is analyzed to examine the human-system interaction issues for the instantiated concept that has been prototyped in the laboratory.

Impact

Our findings help the ATM community to understand potential human performance and human-system interactions issues related to NextGen concepts. The results can lead to better understanding of roles and responsibilities for human operators and automation in future ATM systems.

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